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Understanding eInclusion Gaps Across European Regions: A Benchmarking Analysis

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***Abstract* — This paper analyses digital divide in an Italian region (Piedmont) exploring factors that determine Internet usage by citizens. The research is conducted by using data collected over time by the Piedmont ICT Observatory (PICTO) through a survey on a sample of 2,000 citizens and then comparing them with Eurostat data. Focusing on Piedmont data, multivariate analysis shows that age and education level are the two most important variables that influence Internet usage. Moreover comparing Piedmont with similar European regions, this research has found out that the value reached by Piedmont is not enough high and that this is due to the ageing of Piedmont population and to its lower educational level, confirming the findings of the first part of the study. Thus, the analysis of policies of e-inclusion implemented in such regions aimed to bridge this gap and addressed to the part of the population that has been identified as excluded, would help the policy maker to better understand which actions could be undertaken to increase the number of Internet users in the region.**

Keywords - e-inclusion, digital divide, Internet usage, age, education, benchmarking, policy, ICT

I. INTRODUCTION

Nowadays Information and Communication Technologies (ICT) play a key role in the development of the society. Citizens, enterprises and governments have obtained benefits by using Internet and technologies, such as a reduction in terms of time and costs and improvement in the communication patterns [1]. Nevertheless these evident advantages, in almost all European regions a percentage of the population is still excluded from the Information Society. In addition, Eurostat data shows different ICT usage rates between European regions. Considering all these aspects, the aim of this paper is to discuss the digital divide in the European context, defined by OECD as "*differences between individuals, households, companies, or regions related to the access and usage of ICT*"[1].

Van Dijk [1] identifies 4 types of digital divide:

- Material access (have / have not): it considers problems related to physical access to technologies;
- Motivational access (want / want not): Prior to physical access comes the wish to have a computer and to be connected to the Internet. Many of those who remain on the "wrong" side of the digital divide have motivational problems.
- Skills access (are able / are not able): This kind of digital divide is related to differences in ICT skills. After having acquired the motivation to use computers and some kind of physical access to them, individuals have to learn to manage the technologies.
- Usage access (use enough / not use enough): this kind of digital divide is linked with the differences in the quality of ICT usage and can be observed when the previous types of digital divide (access, motivational and skills) are overcome.

Referring to this definition and analysing data collected in a Italian region (Piedmont) the document will focus on the "motivational access digital divide". Data, in fact, reveal that in Piedmont a threshold in the number of Internet users has been reached even if, comparing Piedmont with other European regions, this value seems too low. Therefore the article aims to identify factors that determine Internet usage by citizens in order to carry off the problem and identify possible policy implications.

Grounding on the previous considerations, this work attempts to answer to the following research questions:

- Which variables determine Internet usage by citizens?;
- Is it possible to increase the number of Internet users in European regions?;
- Which and how e-inclusion policies could be defined?

In order to answer to these research questions, we will start with the investigation on how socio – demographic variables influence Internet usage, then an inter - regional comparison has been carried out to underline the differences between the population of the regions in which the percentage of Internet users is higher and those, like Piedmont, that have reached lower levels.

The main goal of this paper is thereby to define effective e-inclusion policies that could be useful in a European region in which the actual Internet usage rate is still low. This objective will be obtained through three steps:

- Focusing on the characteristics of citizens that are still excluded from the Information Society;

[1] http://stats.oecd.org/glossary/detail.asp?ID=4719

- Considering their motivations for not using the Internet;
- Analysing policies of e-inclusion adopted in some European countries in which the percentage of Internet users is higher and guessing whether and how they could be replicated in the regional context that has been considered.

This paper is structured as follows. Section 2 provides a literature review on the concept of digital divide. Section 3 presents the methodology followed, while section 4 contains the discussion of the main findings and Section 5 describes some policies of e-inclusion implemented in other European regions. Finally, section 6 shows concluding remarks and an indication for possible future research directions.

II. LITERATURE REVIEW

In 2001 OECD defined digital divide as *"differences between individuals, households, companies, or regions related to the access and usage of ICT"*[2]. This concept has changed and developed over years and many researchers have studied this phenomenon.

As it has been said before, Van Dijk [2] identifies 4 types of digital divide: material access, motivational access, skills access and usage access. This paper is focused on the divide due to the differences between people using and not using the Internet. This kind of digital divide has been already studied by many authors in the past years: in 2003 Rice & Katz [4] indicated the differences between Internet and mobile usage by citizens by using regression models with some demographic indicators as independent variables (income, race, gender, work status, marital status, education). They found out that the gap between Internet users and non users could be associated to their income and age, but no longer with gender and race. Furthermore, similar relationships were identified considering mobile usage and the quality and frequency of Internet use. Also Selwyn [5] studied digital divide as differences between Internet users and non Internet users by using logistic regression models and demonstrating that Internet usage depends on the adoption of other technologies, gender, age, education attainments and occupation. These dependencies were discovered also by Di Maggio [6] that, using descriptive data analysis, argued that Internet usage is linked to the place of residence, employment status, income, education attainments, race - ethnicity, age, gender and family structure. In particular he provided evidence that the study of the differences between groups of people with similar characteristics helps to better understand which services can be offered. Another interesting study was the one conducted by Roe [7] who used regression models to indicate that level of education is the strongest predictor variable of computer disquietude, followed by age and then gender. Finally, Kovacic [8] by using loglinear regression combined with classification trees has identified variables that cause Internet usage in order to provide policy implications.

Considering pros and cons of each of those methods, in this paper, regression and classification techniques are considered as the most suitable in order to:

- identify the relationship between Internet usage and a set of socio – demographic variables,
- understand which variables are the most important in this relationship,
- and, above all, classify the population in groups characterized by similar features.

The identification of the factors that lead to the exclusion from the Information Society could be helpful for policy makers who want to guarantee a better inclusion of all individuals in the Society.

Moreover many authors have sought why similar regions have reached different Internet usage rates. For example Vincente [9] makes a comparison between European regions finding which socio – economic indicators determine such differences. Similar analysis are given also by [10], [11], [12], [13], [14].

The analysis of the differences between regions is also useful to set out which policies could be adopted in each region. Many scholars have studied digital divide focusing on the definition of e-inclusion policies through the investigation of the needs of non Internet users and the barriers in adopting the new technologies [15] and [3] or evaluating the implementation of different policies in different countries [16].

In this paper, as shown in Fig. 1, we integrate some of the methodologies presented above in order to present a complete analysis of the digital divide for the regional context considered: using different data sources we will show similar outputs that could be taken into account for the definition of adequate e-inclusion policies.

III. METHODOLOGY

The figure below illustrates the methodology used for this research study. Data collected since 2005 by Piedmont ICT Observatory (PICTO) are used to identify which variables determine Internet usage and the motivations for not using the Internet. Such data have been collected through CATI interviews on a sample of 2,000 citizens each year. The sample has been created considering 3 stratification variables: gender, age and place of residence. After the collection of the data, cases have been weighted to obtain a sample representative of the total population. In addition, Piedmont has been compared with other European regions so as to discover the presence of structural factors in the population that justify, in part, the Internet usage rate reached. Finally, some e-inclusion policies implemented in other European regions have been evaluated (in terms of quality and time). Such initiatives could be considered as examples for policy makers that want to increase the percentage of Internet users in their regions.

[2] http://stats.oecd.org/glossary/detail.asp?ID=4719

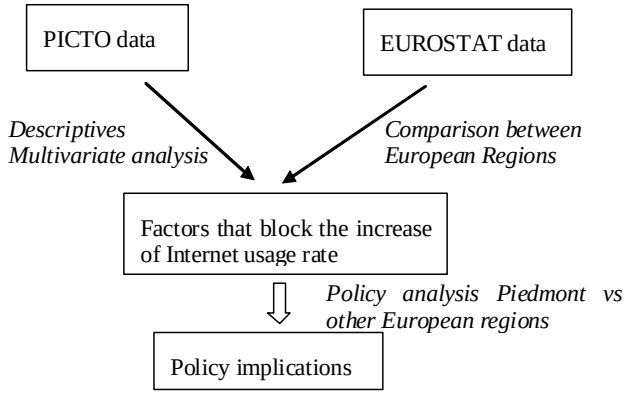


Figure 1. Research methodology scheme

IV. RESULTS

A. Piedmont case study

In this chapter the main findings of PICTO surveys on citizens are analysed.

The graph below indicates a little increase in the percentage of Internet users since 2005, reaching the value of 51% in 2009. It means that almost half of Piedmont citizens are still excluded from the Information Society. Which are the causes that determine this situation?

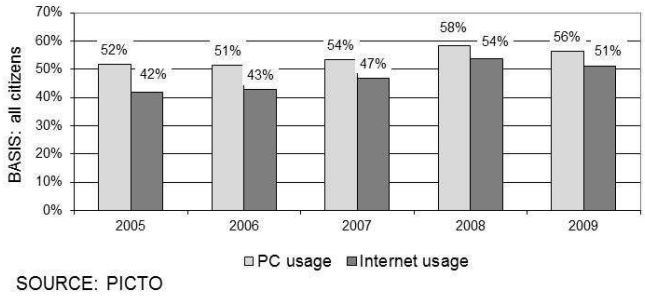


Figure 2. Percentage of citizens using Internet and PC in Piedmont, 2005 – 2009

A detailed study on the characteristics of Internet and non Internet users is necessary for understanding which directions have to be followed to overcome this problem. At first variables that influence Internet usage are pinpointed and after motivations for not using the Internet are considered.

1) Which variables influence Internet usage?

Through multivariate analysis on data collected in 2009, the socio – demographic variables that influence Internet usage by citizens have been discovered.

The following variables have been considered:

1) Gender: male or female
2) Family size: 1, 2, 3, 4, 5 or more members
3) Occupation: employed, unemployed, student, retired, housewife
4) Education: low = primary school degree, medium = secondary school degree, high = university or master
5) Family income (each month): <1,000€; 1.000 - 2.000€; 2.000 – 2.500 €; 2.500 – 4.500€; over 4.500€
6) Age: 16-24; 25-34; 35-44; 45-54; 55-64; 65-74; over 75
7) Municipality size: < 10.000 inhabitants; 10.000 – 500.000 inhabitants; > 500.000 inhabitants
8) Place of residence: 1= citizens that live in Turin province; 0 = citizens that do not live in Turin province

A logistic regression model has been executed for identifying the relationship between Internet usage and the variables listed above. Even if correlation relationship between some of the independent variables considered subsists[3], the regression model is valid. The variance inflation factor (VIF) has been calculated [17] and we have found that multicollinearity does not invalidate the model[4]. Specifically, the regression model shows that Internet usage depends on family size, age, education, family income and gender (Table I).

TABLE I. RESULTS OF THE REGRESSION MODEL ON PICTO DATA (INTERNET USAGE IN PIEDMONT), 2009

Independent variables	*B*	*S.E*	*Wald*	*Sig.*	*Exp (B)*
Gender	-0.483	0.121	15.913	0	0.617
Family size	0.203	0.055	13.847	0	1.225
Employed	0.471	0.514	0.839	0.36	1.601
Unemployed	-0.261	0.546	0.229	0.632	0.77
Student	1.676	0.608	7.596	0.006	5.343
Retired	-0.104	0.53	0.038	0.845	0.902
Housewife	-0.527	0.541	0.95	0.33	0.59
Education	1.094	0.084	168.442	0	2.985
Family income	0.093	0.021	19.632	0	1.098
Age	-0.576	0.056	105.677	0	0.562
Municipality size	0.019	0.103	0.034	0.854	1.019
Place of residence	-0.117	0.16	0.535	0.464	0.89
-2 Log likelihood	1874.659				
Cox & Snell R^2	0.413				
Nagelkerke R^2	0.551				
Overall % of correct classification	81%				

SOURCE: PICTO

Furthermore, using classification trees[5], the most important variables that determine Internet usage have been picked out. The classification tree obtained from the analysis of data collected in 2009 points out that age and education attainments are the most important variables that influence Internet usage. In particular people younger than 44 can be classified in the majority of cases as Internet users, whereas, people older than 65 are mostly non Internet users. Finally, people between 45 and 65 years old can be defined as Internet users only if they have at least a degree.

[3] On request, authors will provide the Pearson correlation matrix.
[4] On request, authors will provide VIF values.
[5] Exhaustive CHAID algorithm

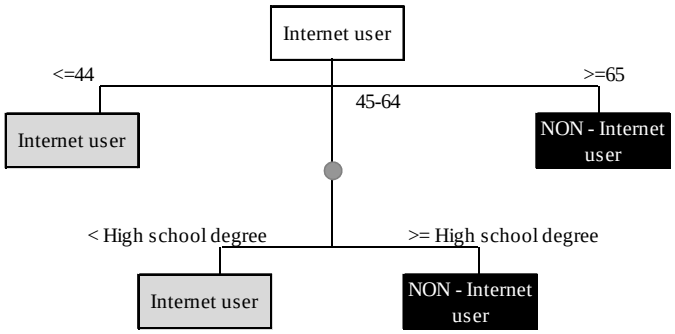


Figure 3. Classification tree PICTO data (Internet usage in Piedmont), 2009

2) Motivations for not using the Internet

The research has then focused on non Internet users. First of all, an analysis on the motivations for not using the Internet has been conducted. 65% of non Internet users said that they were not interested in ICT, 19.6% argued that they have no time enough and 14% have never tried, at least only 6% did not use Internet for access problems. Looking at each age group (Fig. 4) the outcomes are different: in particular for increasing ages, the percentage of "not interested" in technologies grows up and for non Internet users younger than 34 years old problems linked with time or access are more relevant than "not interest". Furthermore not having enough time is a relevant problem for people until 54 years old.

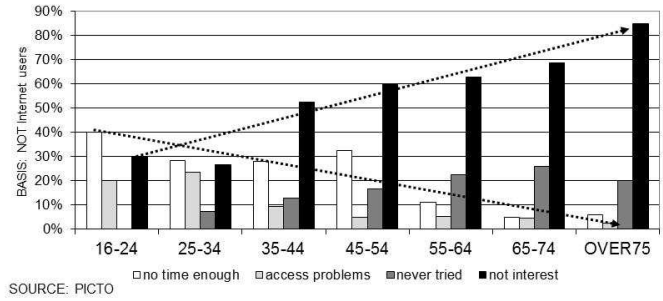


Figure 4. Motivation for not using Internet, by age groups, Piedmont, 2009

These outcomes indicate that non Internet users younger than 55 years (that revealed more tangible problems and represents 1/3 of non Internet users) could be more easily included in the Information Society through adequate policies than older people.

Moreover, comparing Internet and non Internet users younger than 55 years old, education differences emerge. For non Internet users compulsory school degree prevails, instead for Internet users high school degree overbear. Therefore also the lower education attainments of younger non Internet users has to be considered when designing e-inclusion policies.

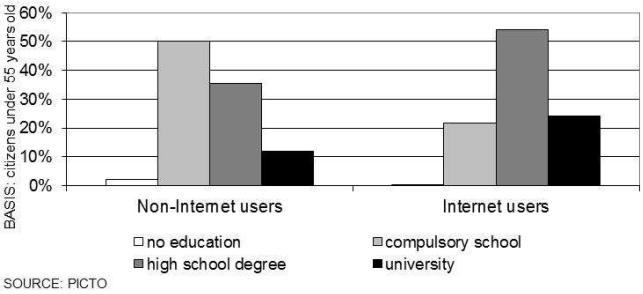


Figure 5. Citizen younger than 55 in Piedmont by education level, comparison between Internet and non Internet users, 2009

These findings are coherent with European Commission researches conducted on all European countries [18] and with other studies on the barriers for not using the Internet [15]

B. Piedmont in Europe: comparison with similar European regions

The next step of the analysis was aimed to collocate Piedmont in the European context and to understand if the Internet usage rate reached is coherent with other similar regions. To this purpose, accordingly with the dimension of the countries in terms of number of inhabitants, we have decided to compare Piedmont with: 1) regions, in the case of the biggest countries[6], 2) the whole country, in the case of the smallest states[7], where the number of inhabitants for each region was too small if compared with Piedmont population.

Looking at data about Internet usage by European citizens (source: Eurostat, 2009), 4 levels can be defined as follows:

- Low, for regions in which less than 40% of citizens use the Internet (South Italy, Greece, South-East Europe).
- Medium, for regions in which 40%-60% of citizens use the Internet (Spain, West France, Centre-North Italy, East Europe).
- Good: for regions in which 60%-75% of citizens use the Internet (Centre Europe).
- Optimum: for regions in which more than 75% of citizen use the Internet (North Europe).

According to this definition the value reached by Piedmont is "medium" but data confirm that the threshold of 50% can be overcome.

The analysis of the differences between Piedmont and countries with at least more than 60% of Internet users could be useful to identify the reasons for Piedmont lateness. Looking at economic indicators (income and GDP), Piedmont seems to be similar to such regions (Table II).

[6] Germany, France, Great Britain, Italy, Poland, Romany, Spain
[7] Belgium; Bulgaria; Czech Republic; Denmark; Estonia; Ireland; Greece; Latvia; Lithuania; Hungary; Netherlands; Austria; Portugal; Slovenia; Slovakia; Finland; Sweden; Croatia; Norway

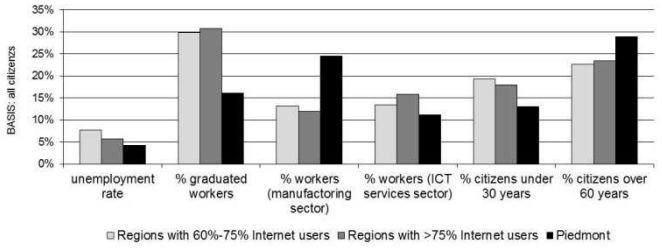
TABLE II. COMPARISON BETWEEN PIEDMONT AND OTHER EUROPEAN REGIONS (ECONOMIC INDICATORS), 2007

	Income (€ / inhabitants) *	**GDP (€ / inhabitants) ***
Regions with 60%-75% Internet users	17,910	27,023
Regions with more than 75% Internet users	22,369	36,506
Piedmont	21,202	28,600

*Mean values

SOURCE: EUROSTAT

Despite, focusing on the structure of the population, some differences are clearly visible (Fig.6). In particular, they regard: 1) education attainments: in Piedmont the percentage of graduated workers is lower than in the other regions of the comparison; 2) industrial structure: in Piedmont the number of citizens working in the manufacturing sector is bigger than in the other regions; 3) ageing of the population: in Piedmont there are less young people and more elderly citizens than in other countries.



SOURCE: PICTO - Eurostat

Figure 6. Differences in the population (Piedmont vs regions with more than 60% Internet users), 2009

Furthermore looking at each age group and at each part of the population with the same education level, we have been able to better understand differences between Piedmont and some regions with more than 60% of Internet users. Table III represents the percentage variation between the number of Internet users in Piedmont and in some countries with more than 60% of Internet users by age and education: the biggest differences in the number of Internet users are visible for people with more than 45 years and a lower education level.

TABLE III. DIFFERENCES IN THE % OF INTERNET USERS BY AGE AND EDUCATION LEVEL BETWEEN PIEDMONT AND COUNTRIES WITH MORE THAN 65% OF INTERNET USERS, 2009

	Age						**Education**	
	16_24	***25_34***	***35_44***	***45_54***	***55_64***	***65_74***	***high***	***< high***
Austria [67%]	1%	-4%	-9%	-20%	-21%	-42%	-20%	-21%
Belgium [70%]	3%	-8%	-10%	-24%	-31%	-58%	-24%	-31%
Finland [79%]	-2%	-19%	-22%	-38%	-44%	-63%	-38%	-44%
Denmark [82%]	-1%	-15%	-22%	-37%	-50%	-77%	-37%	-50%
Netherlands [86%]	-3%	-18%	-25%	-39%	-54%	-77%	-39%	-54%
Sweden [86%]	-3%	-18%	-26%	-41%	-55%	-75%	-41%	-55%
Norway [88%]	-3%	-19%	-26%	-39%	-53%	-81%	-39%	-53%

SOURCE: PICTO – EUROSTAT

Results obtained splitting the population by age and education reveal that differences in the number of Internet users between Piedmont and the other European regions are evident for elder and less well-schooled people, instead, for example, the part of young (16-24 years old) citizens that use Internet is the same in Piedmont and in the other countries considered. Hence it would be useful to understand how European regions considered have been able to promote Internet usage between that part of the population that now has reached values considerably higher than Piedmont. In particular we are interested not only to analyse policies aimed to promote Internet usage among elderly people (that as shown in Fig. 4 are simply "not interested") but above all individualize actions addressed to adults non Internet users (e.g. citizens younger 55 with a low education level) that represent a significant quote of non Internet users and seem to be more interested in technologies if they discover their utility and benefits .

Finally the lag between Piedmont and the regions / countries that have more than 60% of Internet users has been calculated as follows:

TABLE IV. PIEDMONT LAG

	Country	**51% Internet users (year)**
Countries with 60%-75% Internet users	Ireland	2007
	Latvia	2007
	Slovakia	2007
	Estonia	2005
	Austria	2006
	Belgium	2005
Countries with more than 75% Internet users	Finland	2003 (58%)
	Denmark	2003 (64%)
	Netherlands	2005 (74%)
	Sweden	2003 (69%)
	Norway	2003 (66%)

SOURCE: EUROSTAT

For each country Table IV indicates the year in which the percentage of Internet users was 51% (actual value for Piedmont region)[8]. Piedmont delay is equal to 3-5 year if compared with regions in which Internet usage rate is defined as "good", while it is about 10 year for the countries in which the rate is "optimum".

To sum up, the research on Piedmont data has proved that:

- The percentage of Internet users of the region could rise with adequate policies.
- Age and education level are the 2 variables that influence more Internet usage by citizens.
- It seems to be useful to intervene on non Internet users younger than 55 years, remembering their lower education level and bonds related to the availability of time and access difficulties.

[8] Eurostat data are available since 2003, otherwise for some countries the value reached in 2003 was bigger than 51%, in the table we put in brackets the value reached in 2003

- Comparing Piedmont with other countries in which the percentage of Internet users is higher than 60%, differences in the characteristics of the population are evident. They are due to age, education and industrial structure.
- It has been measured a lag between Piedmont and other regions of about 5-10 years.

Referring to these results, in the next paragraph a review of the policies of e-inclusion implemented in the regions to which Piedmont has been previously compared is suggested, in order to identify differences in the quality and in the timing of policies proposed. Finally a list of suggestions for obtaining in the future a better inclusion of citizens in the Information Society is shown.

V. POLICY ANALYSIS

The European action plan i2010 has set some goals in order to obtain a better development of Information Society in all countries. The plan indicates 13 guidelines [19] regarding different issues such as services offer, infrastructure, enterprises development, support to the innovation and social inclusion, indeed. The eighth guideline "*Further development of eAccessibility and a comprehensive eInclusion strategy*", is strictly related to e-inclusion matters.

Furthermore the analysis of digital literacy initiatives [18] underlines that the phenomenon of digital divide is composed by 3 stages concerning at first access problems, then skills problems and finally difficulties in a mature Internet usage. This is coherent to the model proposed by Van Dijk [2]. Specifically, the digital literacy initiatives can be classified in four groups: 1) Motivation: This kind of initiatives are aimed at boosting motivation and raising awareness on ICT, in this way the most frequently cited reason for not having the Internet at home – no perceived need or lack of interest in using it – could be overcome. It is important to suggest to the potential new Internet user all benefits of using the Internet such as time / money saving, easier communication, usage of services suitable for everyday life. In these initiatives "intermediaries" have an important role to approach people with the ICT. 2) Affordability and sustainability: in this case are collected all initiatives aimed at assuring availability of PC and Internet (at lower prices) in all families and public offices. 3) Content and delivery mode: some actions are addressed to web content and services offer. Content should fit personal interests of people not using the Internet yet: these citizens should understand its utility and ride out their fears, for example through intermediaries or informal learning. 4) Accessibility and usability: at least some initiatives that promote accessible services for every user are promoted. They use adequate interfaces and support an easy learning. In Table V, as example, some European initiatives are listed. In the first column of the table there is a short description of each initiative, while in the second column the main points that will be useful for the definition of future policies are summarized. The table shows that almost all the initiatives started already in 2000 and are aimed to cope with the problems that have been identified in the previous part of the paper.

TABLE V. EXAMPLE OF E-INCLUSION INITIATIVES IN EUROPE

INITIATIVE	FOCUS
Mukanetti (Finland) (since 2000) OBJECTIVE: promote equality inter generations	Training of older people Remove fear towards ICT
IT for the terrified (UK) (since1999) OBJECTIVE: informal training → training section in familiar and friendly athmosphere managed by volunteers Attention to everybody needs	Informal training
Grandparents & Grandchildren (EU, since 2007) OBJECTIVE: tackle digital divide and develop inter generational dialogue → ICT training in a easy and familiar way	Importance of intermediaries in the approach to the ICT of older people
UK Online centres (UK) (since 2000) OBJECTIVES: - promote public Internet / PC access - improve quality of life - reinforce sense of community - social inclusion	Promote Internet access from who has not Internet at home Reinforce sense of community
Digital Communities (Ireland) (since 2003) OBJECTIVE: action for places in qhich there i san high unemployment rate and lower education level Training and creation of community ICT centres	Support to unemployed and citizen with lower education level

In conclusion, considering both the characteristics of the population and the quality of e-inclusion policies implemented in the European regions, this research has led to the definition of some suggestions that could be addressed to policy makers that want to plan future policies of e-inclusion in a region, like Piedmont, where, even though the contextual background is quite good (looking at economic indicators - income, GDP - it is similar to the richest regions of Europe), the percentage of Internet users is still too small.

The first remark has to deal with the purpose of using the Internet. Citizens that are out of the Information Society will approach to the ICT when they will perceive its utility for their everyday life. This is the reason why, the promotion of Internet usage for personal purposes and not only for professional aims, should be encouraged. For example, younger non Internet users, that are almost all workers, say that they do not use the Internet because they do not have time. In this case policy makers should think about how Internet usage would help this group of people providing useful and easy services. Moreover, the awareness on the benefits that Internet could provide to people, in particular for the group of non Internet users more approachable (under 55 years old), should increase by: 1) using habitual technologies (eg. mobile phone, television) to which also non Internet users are accustomed; 2) promoting Internet access in public places where citizens that now are excluded from the Information Society are used to meet: in this way they would begin to know the potentialities of Internet and they would try to use it with the help of familiar people; 3) encouraging informal training, also through the role of friends and relatives that will help them in the use of the Internet (intermediaries); 4) advertising on Internet use through traditional channels (radio, TV), in order to increase the awareness about services offered and all benefits that Internet could bring in everyday life. At least it is important to pay attention on services offered on line: not always they are easy to use and sometimes citizens do not know their existence .

VI. CONCLUSIONS

This paper has investigated the digital divide, considered as differences between Internet users and non users, in a European region. Even though research on this topic has been carried out in past years, we propose a framework that, thanks to the analysis of factors and motivations that block citizens in using the Internet and through a benchmarking between comparable European regions, leads to the identification of adequate policies that could be implemented in a region, like Piedmont, that has to cope with problems related to the inclusion of citizens in the Information Society. The main findings of the research can be summarized in the following three points.

First, age and education are the two variables that mostly determine Internet usage. Focusing on data collected in Piedmont, through multivariate data analysis the variables that determine Internet usage have been discovered and then they have been taken into account when analysing motivations for not using the Internet. In the case of Piedmont region this kind of analysis showed that problems linked with age and education are the most relevant and that, focusing on non Internet users, the motivation for not using the Internet varies from time and access problems to a lack of interest as the age of the respondent increases. Furthermore non Internet users have also a lower education level than Internet users.

Second, for similar regions differences in the characteristics of the population influence the Internet usage rate reached. In the second step of the study, in fact, the region has been analysed in the European context. Specifically, Piedmont has been benchmarked with other regions, considering both socio – economic features both Internet usage rates. This comparison showed that, even if Piedmont is similar to the richest and most developed European regions, the Internet usage rate is still low. Instead, the main differences are related to the education level, to the ageing of the population and to the industrial structure of the region. Moreover the delay between Piedmont and regions in which the Internet usage rate is higher has been estimated.

Finally, e-inclusion policies should meet non users needs and features. The research proved that in the case of Piedmont region the group of individuals that more easily could be integrated in the Information Society has been identified in non Internet users younger than 55: older non Internet users are, in general, simply not interested in the technologies, while younger citizens complain the lack of time and access difficulties. These last problems are more tangible than "not interest" and give more precise indication about non users needs to policy maker that have to plan new policy actions. Moreover, considering these findings, some e-inclusion policies implemented in the European regions in which the percentage of Internet users is the highest have been considered and focusing on the problems underlined for the regional context examined some suggestions for bridging this kind of digital divide have been extracted. For instance the research highlights that the number of Internet users will increase if citizens perceive ICT utility for their everyday life and not only for school or work purposes. In addition, policy makers should be aware of the difficulties in using ICT argued by non users and define new policies that meet non users needs. For this purpose they could consider the provision of on line services through technologies to which all citizens are accustomed (mobile phone, television) and promote Internet access in public places. Furthermore non Internet users should increase their consciousness of the benefits of Internet in their life. To this aim the role of the social network is fundamental: friends and relatives should help non Internet users in adopting the new technologies, but also information provided through traditional channels (radio and TV) will play a key role.

A potential limitation of this research is given by data constraints in the comparison between Piedmont and European regions, in fact we have considered 2 different data source: PICTO (for Piedmont) and Eurostat (for European regions). Even if these 2 data sources do not offer information with the same detail, we have been able to exploit a regional problem (using PICTO disaggregated data) to the European context (using Eurostat aggregate data that confirmed our previous findings). Future research may update results obtained in order to discover if this kind of digital divide is closing and verifying the efficacy of policy proposed. Afterwards the analysis on the differences between Internet users and non users could be integrated with a study on the behavior of citizens over the Internet.

ACKNOWLEDGMENT

Authors would like to thank I-PAS project, funded by Piedmont Region, as a support for the policy analysis conducted.

REFERENCES

[1] European Commission, "Study on the Social Impact of ICT", 2010.

[2] J. Van Dijk, "Digital divide research, achievements and shortcomings", Poetics, 34(4-5): p. 221-235, 2006.

[3] E. Ferro, N.C. Helbig, J.R. Gil-Garcia, "The role of IT literacy in defining digital divide policy needs", Government Information Quarterly, 28(1): pp. 3-10, 2011.

[4] R.E. Rice, J.E. Katz, "Comparing Internet and mobile phone usage: digital divides of usage, adoption, and dropouts", Telecommunications Policy, 27(8-9): pp. 597-623, 2003.

[5] N. Selwyn, "Digital division or digital decision? A study of non-users and low-users of computers", Poetics, 34(4-5): pp. 273-292, 2006.

[6] H. Di Maggio, E. Hargittai, C. Celeste, S. Shafer "Digital inequality: from unequal access to differential use", The inequality reader, 2007.

[7] K. Roe, A. Broos., "Marginality in the Information Age: The Socio-Demographics of Computer Disquietude", Communications: The European Journal of Communication, 30 (1):pp. 91–96, 2005.

[8] Z. Kovacic, D. Vukmirović, "ICT Adoption and the Digital Divide in Serbia: Factors and Policy Implications". Proceedings of the Informing Science & IT Education Conference, 2008.

[9] M.R. Vicente, A.J. López, "Assessing the regional digital divide across the European Union-27", Telecommunications Policy, 35 (3), pp. 220-237, 201.1

[10] R. Agarwal, A. Animesh, K. Prasad, "Social interactions and the 'previous termdigital dividenext term': Explaining regional variations in Internet use", Information Systems Research , 20 (2): pp. 277–294, 2009

[11] L. Andrés, D. Cuberes, D. Mame, T. Serebrisky, "The diffusion of the Internet: A cross-country analysis", Telecommunications Policy, 34 (5-6): pp. 323–340, 2010.

[12] M. Billón, R. Ezcurra, F. Lera-López, "The spatial distribution of the Internet in the European Union. Does geographical proximity matter?", European Planning Studies, 35 (3):pp. 119–142, 2008

[13] BISER ,"BISER eEurope Region. Benchmarking Report", 2004.

[14] M.D. Chinn and R.W. Fairlie, “The determinants of the global previous termdivide:next term A cross-country analysis of computer and Internet penetration”, Oxford Economic Papers, 2007

[15] P. Verdegem, P. Verhoest, “Profiling the non--user: Rethinking policy initiatives stimulating ICT acceptance”. Telecommunications Policy, 33: pp. 642-652, 2009

[16] M. G. Quibria, S.N. Ahmed, T. Tschang, M. Reyes-Macasaquit “Digital divide: determinants and policies with special reference to Asia” Journal of Asian Economics, 13(6): p. 811-825, 2003.

[17] R.M. O’Brien, “A Caution Regarding Rules of Thumb for Variance Inflation Factors”, Quality & Quantity, 2: pp. 673–690, 2007.

[18] European Commission, “Digital Literacy European Commission Working Paper and Recommendations from Digital Literacy High-Level Expert Group”, 2008.

[19] European Commission, “Europe's Digital Competitiveness Report, Main achievements of the i2010 strategy 2005-2009, i2010 - List of actions” 2009.